

**SUMMARY  
OF  
FINAL WATER RANGE CONDITION ASSESSMENT REPORT  
FOR THE  
ATLANTIC TEST RANGE  
WATER RANGE**



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## Executive Summary

Water Range Condition Assessments (WRCA) are required by the *U.S. Navy Water Range Sustainability Environmental Program Assessment (WRSEPA) Policy*, 2008 and satisfy the requirements of Department of Defense (DoD) Instruction 4715.14, *Operational Range Assessments*. The WRCA process supports the sustainment of ongoing Navy operations by assessing and managing the present environmental condition of every active water range under Navy control. The findings and recommendations in WRCA reports support informed range management decisions, ensure water range compliance with applicable environmental laws and regulations and provide for continued protection of public health and the environment.

This report entails the findings of the WRCA of the Atlantic Test Range (ATR) Water Range (Figure 1). The ATR Water Range supports aircraft testing and training activities conducted by the Naval Air Systems Command (NAVAIR) at Naval Air Station (NAS) Patuxent River, Maryland. The ATR Water Range is designated in 33 CFR 334.200 as a military water range where only inert (non-explosive) munitions may be expended. Aircraft testing and training activities include the release of non-explosive practice munitions (NEPMs) and inert military expended materials (MEMs) over the ATR Water Range.

A Technical Team from the NAVAIR Ranges Sustainability Office at the ATR (ATR SO) conducted the ATR WRCA. The ATR SO assessed the potential for introduction of munitions constituents (MCs) and military expended material constituents (MEMCs) into the environment through the historical and ongoing expenditure of NEPMs and MEMs into the ATR Water Range, in accordance with the Navy's WRSEPA Policy. Utilizing the supporting Final Draft WRSEPA Guidance, the ATR SO Technical Team conducted a risk-based, three-phased study consisting of Range Categorization and Prioritization; Information Collection and Compliance Review; and Source/Pathway Assessment. Each phase of the WRSEPA process guided the Technical Team to collect and analyze water range utilization and environmental information needed to address questions at key Decision Points. The Decision Points address whether munitions-related operations present an unacceptable risk to human health and the environment and, in turn, potentially threaten the sustainment of the water range.

### WRCA Phase I: Range Categorization and Prioritization

Categorizing the Navy's water ranges is the first step in determining which ranges receive the highest priority for a water range assessment. The WRSEPA Policy categorizes water ranges as either Category 1 or Category 2, based on the following definitions:

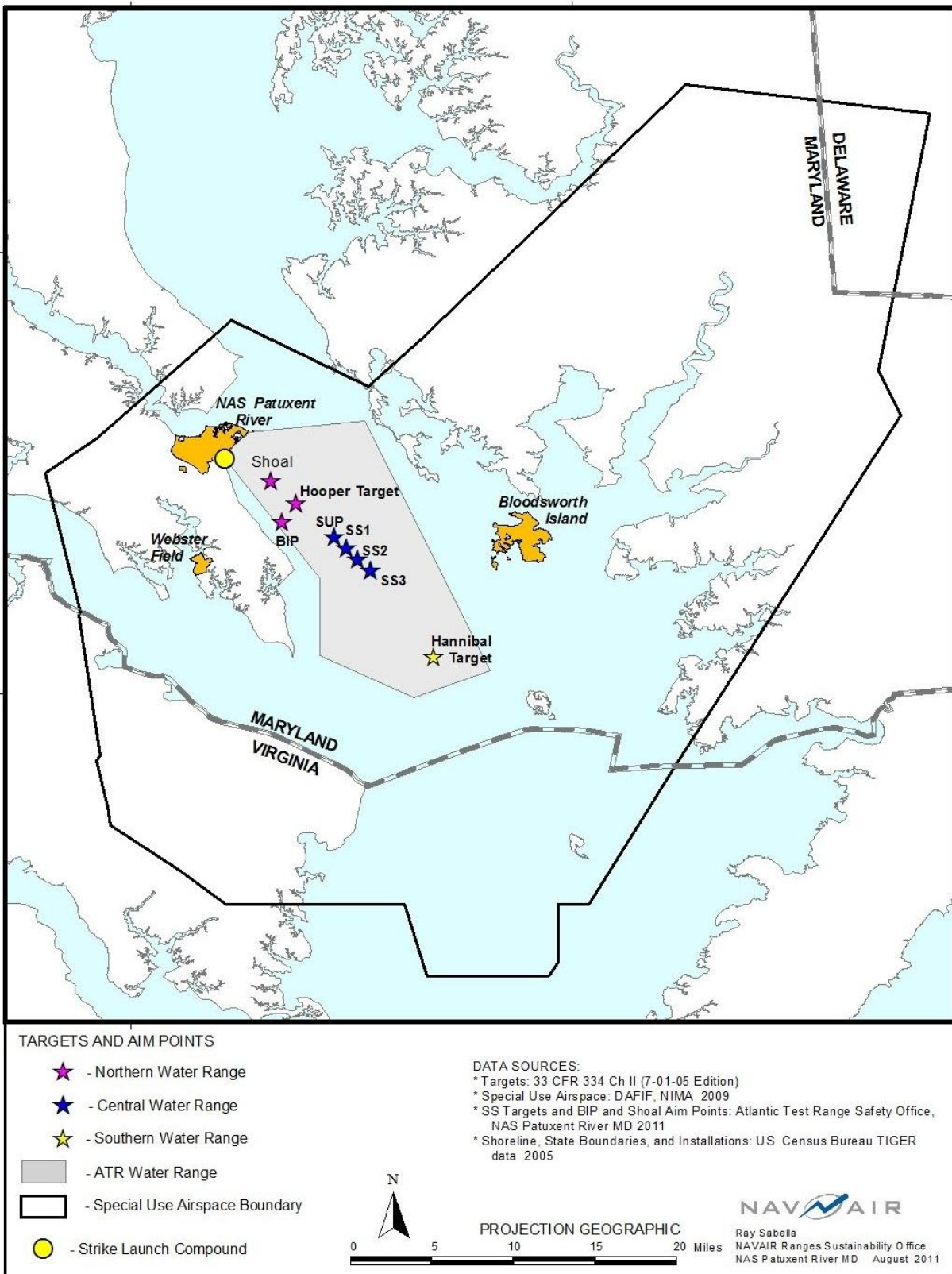
Category 1: "Ranges that are within the baseline from which the territorial sea is measured, such as bays, lakes, rivers, etc., and that have specific/distinct operational aim or use points (typically within state waters)."

Category 2: "Operational areas and ranges that are beyond the baseline from which the territorial sea is measured, such as oceans, seas, etc., and that have non-specific/non-distinct operational aim or use points (typically beyond state waters)."

Since the ATR Water Range is located in the Chesapeake Bay, entirely within Maryland state waters, and contains several fixed aim points and targets, it meets the definition of a Category 1 water range, and is high in priority for assessment under WRSEPA.

### WRCA Phase II: Information Collection and Compliance Review

In Phase II of the WRCA, the SO Technical Team collected data on the ATR Water Range. This was done by accessing the 2009 Archival Search Report, an accounting of historical range utilization and stores releases from 1956-2007. Additional information regarding range usage was gathered through interviews with multiple range, installation and environmental program Subject Matter Experts at NAS Patuxent River and through review of the munitions expenditure data captured within the SO monitoring and tracking database. These data were used to estimate range usage from 1956 through 2012.



**Figure 1. The Atlantic Test Range Inner Range**

The data and interviews verified that no high explosive (live) munitions have been expended into the ATR water range and that large quantities of inert munitions have been expended. The Technical Team determined during Phase II that these expenditures predominantly occurred at the water range's designated targets, aim points and impact areas, including the Bay Forest Impact Area (BIP), Shoals Impact Area, the Hooper Target Complex, the Supersonic Aim Points (SUP, S1, S2, S3) and the Hannibal target (See Figure 1).

Quantifying the numbers, types and locations of NEPMs and MEMs expended in the ATR Water Range was essential to determining the estimated potential constituent loading in the range areas analyzed. Fourteen categories of NEPMs and MEMs were identified as having been expended in the ATR Water Range. Munitions utilization data sources varied in availability and quality over the 70 years the range has been in operation, with the modern era (1999 – 2012) being the most detailed by including surface impact points. The Final ATR WRCA report addresses these data sources and their characteristics and how munitions data was compiled and analyzed, including the types, locations and quantities of munitions expended over the years.

The Technical Team also conducted an environmental regulatory applicability and compliance assessment of munitions-related operations at the ATR Water Range, in accordance with the WRSEPA process. The Team reviewed range operational and environmental documents and interviewed range and installation environmental personnel to assess the applicability of Federal and state environmental statutes and regulations, as well as Navy requirements on the use of inert munitions in the ATR Water Range. The Technical Team concluded from their review that the munitions-related operations at the ATR Water Range are in compliance with all applicable Federal and state regulations and U.S. Navy environmental program requirements.

### **WRSEPA Decision Point 1 – Phase II Conclusion and Recommendation**

*Decision Point (DP) 1: Are Further Steps Needed to Ensure Sustainability of the Water Range?*

Based on information collected during WRCA Phases I and II, the Technical Team was able to address Decision Point (DP) 1. To do so, a series of DP 1 sub questions were addressed, to include the following:

*DP 1.1 Question: Does the range either currently have or historically had fixed use or aim points where live munitions or MEMs are or were used?*

**Answer:** Yes. Though live (high explosive) munitions have never been used, NEPMs and MEMs have been expended at or in the vicinity of the ATR Water Range fixed surface targets since the early 1940s and at additional aim points and impact areas since the 1970s and '80s.

*DP 1.2 Question: Is the range area also utilized for non-military purposes?*

**Answer:** Yes, there is very active commercial and recreational use of the Chesapeake Bay waters within the ATR water range.

Based on the information collected during WRCA Phases I and II and the answers to DP 1 sub-questions, the answer to the overarching DP 1 question is, "yes, further steps are needed to ensure sustainability of the ATR Water Range." Per Final Draft WRSEPA Guidance, the Technical Team was required to proceed to the next phase of the WRSEPA process and conduct a WRCA Phase III assessment.

### **WRCA Phase III: Source/Pathway Assessment**

The purpose of WRCA Phase III is to further assess the environmental condition of the range for risks to human health and the environment associated with MCs and MEMCs. Using the results of an Operational Range Site Model (ORSM) and Fate and Transport (F&T) analysis, the Technical Team determined the potential for risk by assessing whether or not a completed source-receptor pathway exists.

#### **Operational Range Site Model (ORSM)**

The purpose of the ORSM is to understand how the water range is used by the military, the public, and the natural resources of the Bay environment; and how these three components interact. To gain this understanding, the Technical Team studied the historical and current quantities of NEPMs and MEMs

expended into the water range, the physical and biological environment of the middle Chesapeake Bay, and the cultural and socioeconomic resources present in and around the ATR Water Range.

The operational and historical use analysis of the range identified three areas where there has been a concentration of munitions expenditures that are located in the vicinity of the ATR Water Range targets, impact areas and aim points (identified in Figure ES-1). Areas of concentrated use will have higher concentrations of expended munitions and the greatest potential for concentrations of MCs and MEMCs. Therefore, it is important to characterize areas of concentrated use and their potential for interactions between munitions, MCs of concern, the public and the environment. There is little variation in the water chemistry, biological activity and public use of each of the three areas of concentrated use. Therefore, the following summarizes the similarities and differences in the operational and physical characteristics of the three major concentrated use areas within the range that could influence the potential introduction of MCs and MEMCs into the surrounding media.

- **Northern Water Range (NWR)** - There are no specific aim points present at either Shoal or BIP and the buoys present within the Hooper Target Complex are for reference only. It is anticipated that expended NEPMs and MEMs are scattered in a north to south direction along the Shoal and BIP. Fourteen different types of munitions totaling 102,296 individual munition expenditures have been expended within the NWR since 1956.

The NWR is located on the western side of the Chesapeake Bay and is subject to high sedimentation rates associated with the cyclonic (counterclockwise) water current circulation pattern of the Bay (Zhong & Li, 2006). The majority of the bottom present within the NWR consists of mud and silt. The only impact area within the NWR that has hard sandy bottom present is BIP and it is typically utilized for expenditure operations that require the recovery of the expended munition.

- **Central Water Range (CWR)** - The CWR was and is used to evaluate the safe separation characteristics of bombs expended during supersonic flights. A total of 1,001 NEPM bombs have been expended within the CWR since 1956. There are no physical structures present within the CWR to mark the location of the aim points. Therefore, it is expected that munitions expended within the CWR would be scattered and less concentrated.

Similar to the NWR, the CWR is located on the western side of the Bay and has a high sedimentation rate associated with the current pattern of the Bay. However, the CWR has a hard sandy bottom, which reduces the potential for impact burial. Therefore, it would be expected that there would be an increased number of expended munitions present at sediment surface.

- **Southern Water Range (SWR)** - The SWR is the only area of concentrated use that has a fixed impact target (Hannibal Target). Munitions expenditure operations occurring in the SWR typically fire directly at or towards Hannibal target. Based on the operational use of the fixed target, it is anticipated that concentrations of expended munitions would be found in and around the entire target. Fourteen different types of munitions totaling 1,429,019 individual munition expenditures have been expended within the SWR since 1956.

The SWR is located on the eastern side of the Chesapeake Bay and is subject to higher salinity levels due to the cyclonic water current circulation pattern of the Bay. The majority of the bottom present within the SWR target area consists of hard sand. Therefore, it would be expected that there would be an increased number of expended munitions present at sediment surface.

Due to the quantity of munitions expended and the presence of a hard, sand bottom, the Technical Team concluded that the greatest potential for corrosion of munitions (and potential release of MCs) exists within the SWR.

## **WRSEPA Decision Point 2.1**

At the conclusion of the ORSM, the Technical Team examined the potential for source-receptor pathway interactions considering the disposition of munitions, environments, and use by humans and wildlife within the NWR, CWR and SWR. Based on this assessment, the Technical Team was able to address DP 2.1.

*DP 2.1 Question:* Does ORSM indicate a completed or potentially completed pathway for humans or wildlife?

**Answer:** Yes. The ORSM indicates a potentially completed pathway for humans or wildlife.

Per Final Draft WRSEPA Guidance, since the Technical Team concluded that there is the potential for a completed transport pathway between MCs/MEMCs and receptors, the Technical Team proceeded to address DP 2.2, which asks whether predictive modeling indicates that potentially completed pathways may result in concentrations of MC/MEMCs that pose a potential unacceptable risk to human health or the environment. The following provides a summary of the approach the Team used to conduct the F&T and predictive modeling analyses.

### **Fate and Transport**

Per Final Draft WRSEPA Guidance, an F&T analysis was conducted by the Technical Team for the ATR Water Range to determine if MCs and MEMCs potentially introduced into the exposure media could be present at concentration levels that would adversely affect human health and the environment. Since the ATR is an inert-only water range, the majority of the constituents that make up the inert munitions are not of potential concern (e.g., steel and iron). However, some inert munitions used on the range may contain a small percentage of metal constituents of potential concern. Therefore, the Technical Team focused its efforts on identifying areas that had the greatest potential for containing high concentrations of metal MCs and MEMCs of potential concern (e.g., lead).

To focus the F&T analysis, the Technical Team identified specific areas (“areas of analyses”) within the NWR, CWR, and SWR where the majority of expended NEPMs and MEMs are expected to be located. Since the Technical Team was unable to quantify the exact number of expended munitions per area of analysis, the Team took a conservative analytical approach by allocating the total quantities of munitions expended within the larger areas of concentrated use (i.e., NWR, CWR and SWR) to their respective smaller areas of analysis.

Based upon the information gained in the ORSM for the NWR, CWR and SWR, the Technical Team determined that the environmental and operational criteria presented in Table 1 are the most conducive to corrosion, resulting in the potential introduction of MCs/MEMCs of potential concern into the environment.

**Table 1. Criteria Matrix to Determine Areas of Analysis Requiring F&T Analysis**

<b>Areas of Analysis</b>	<b>Sandy Sediment</b>	<b>High Number of Expended NEPMs/MEMs (&gt;10,000/2 Grids)</b>	<b>Total Mass of MCs/MEMCs of Potential Concern Contained within Expended Munitions (pounds [lbs])</b>	<b>Requires Further F&amp;T Analysis?</b>
NWR (Center Main)	No	Yes	3,941	No
NWR (BIP)	Yes	No	1,506	No
CWR (SUP-SS1)	Yes	No	1,427	No
SWR (Hannibal target)	Yes	Yes	81,531	Yes

The SWR area of analysis was the only area of concentrated use that met all the criteria and was carried forward for additional F&T analysis. This is because the SWR is the area of analysis with the highest expected concentration of munitions, with the greatest mass of MCs and MEMCs of potential concern, and the environmental conditions that are most favorable for the potential release of MCs and MEMCs. Further analysis of munitions expended within the SWR and their constituents revealed that lead and copper present in small caliber gun ammunition contribute the greatest mass of MCs of potential concern within not only the SWR, but in the ATR Water Range, thereby making copper and lead good representative MCs for assessing risk to the SWR and the entire range.

### **Predictive Modeling/Screening-Level Assessment**

The Technical Team used a reasonable most conservative analytical approach to ensure that MC and MEMC concentrations and potential receptor exposures were not underestimated. The DoD Range and Munitions Use Subcommittee (RMUS) identified a set of conservative MCs and MEMCs of potential concern and associated screening values to which estimated sediment and water column concentrations data were compared. The Technical Team compared the RMUS screening values to the Environmental Protection Agency's National Recommended Water Quality Criteria (Clean Water Act, Section 304(a))

and verified that the RMUS screening values were more conservative. Per WRSEPA Policy, it was assumed that if estimated copper and lead constituent levels did not exceed the DoD RMUS screening values under the most conservative scenario then no further assessment would be required. Appendix B of the ATR WRCA report provides the basis for the conservative assumptions made and the mass loss/loading calculations performed.

For the SWR area of analysis, the predictive modeling results for copper and lead indicated that no estimated concentrations exceed the RMUS screening values for marine sediments or the water column. Since copper and lead were the predominant MCs and MEMCs of potential concern in the SWR area of analysis, no further analysis was warranted.

Using the same conservative assumptions in calculating copper and lead concentrations for NEPMs and MEMs expended within the SWR over the past 56 years, the Technical Team estimated that copper and lead concentrations would not likely exceed RMUS screening values for at least an additional 126 years for marine sediments and over 1,000 years for the marine water column. Again, this assumes that the overall types, quantities and constituents of NEPMs and MEMs expended in the future remain consistent with historical and current usage. The report explains why this is not likely due to the very conservative assumptions used in the F&T and predictive modeling analysis.

### **Data Extrapolation**

To minimize the need to collect site-specific data, the WRSEPA Policy and Final Draft WRSEPA Guidance include provisions for extrapolating relevant data from environmentally and operationally similar ranges to maximize available information from other pertinent studies. The conclusions of sampling studies conducted on other Navy ranges that are similar in environment and operational use to the ATR Water Range are consistent with the conclusions of this ATR WRCA study, based upon estimated concentrations of MCs/MEMCs of potential concern.

### **WRSEPA Decision Point 2 – Phase III Conclusion and Recommendation**

Based on information collected during F&T analysis and predictive modeling/screening level assessment of the ATR Water Range, the Technical Team was able to address DP 2.2 and 2.3:

*DP 2.2 Question: “Does predictive modeling indicate a potential unacceptable risk to human health and the environment?”*

**Answer:** No. Using RMUS screening values as an indicator of risk, predictive modeling indicated that concentrations of MCs and MEMCs of potential concern in ATR Water Range sediments are well below levels that would cause adverse effects to human health and the environment.

*DP 2.3 Question: “Is there other evidence of potential unacceptable human health and environmental impacts?”*

**Answer:** No. There is no evidence that munitions expenditure activities in the ATR Water Range are a source of other potential unacceptable human health and environmental impacts.

Therefore, no unacceptable risks to human health and the environment resulting from the historic, current and future usage of the ATR Water Range are anticipated. Based on the Final Draft WRSEPA Guidance and the findings of the ATR WRCA, the Technical Team recommended concluding the ATR WRCA.

### **Protective Measures**

Records review and interviews with environmental compliance managers and ATR personnel indicate that munitions-related activities within the ATR water range operate in compliance with all U.S. Navy environmental programs and associated Federal environmental regulatory requirements that apply to operational military ranges. The ATR monitors and tracks all test and training activities occurring on the range and performs environmental reviews of all proposed activities to ensure that they fall within the scope of activities addressed in the Patuxent River Complex Final Environmental Impact Statement. In addition, the findings of this study do not indicate a potential unacceptable risk to human health and the environment from munitions-related operations within the ATR Water Range. Therefore, no recommended protective measures above the current range management and environmental compliance procedures have been identified.